
Quantifier interpretation in Chuj: Implications for theories of the weak/strong contrast¹

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1 Introduction

- Partee (1989) (building on Milsark 1977, Westerståhl 1985) influentially proposed that “value-judgment quantifiers” (Keenan & Stavi 1985), like ‘few’ and ‘many’, have two distinct meanings:
 - (1) **Cardinal ‘weak’ reading of ‘few’:** *There were few faculty children at the party.*
→ true if the number of faculty children is low (e.g., 3), and true even if all came
 - (2) **Proportional ‘strong’ reading of ‘few’:** *Few cats eat vegetables.*
→ only true if a small proportion (and not all) cats eat vegetables.
- A natural way to analyze these two interpretations is via a lexical ambiguity (e.g., Westerståhl 1985, Partee 1989, Diesing 1992, de Hoop 1992, Romero 2021):
 - (3) ***Few* as a cardinality predicate = ‘weak quantifier’**
 $\lambda x. |x| < n$, n is contextually set standard (alternatively: $\lambda P. \lambda Q. |P \cap Q| < n, n$)
 - (4) ***Few* as a proportional determiner = ‘strong quantifier’**
 $\lambda P_{NP}. \lambda Q_{VP}. |P_{NP} \cap Q_{VP}| / |P_{NP}| < p$, p a contextually set standard proportion
- In both cases the value for n or p is “vague” and must be determined by a contextual standard.
- Crucially, though, *cardinality* vs. *proportionality* is encoded **lexically**.
- Whether these interpretations should stem from a lexical ambiguity, and not from a theory of how n and p should be defined, has long been questioned (see e.g., Westerståhl 1985, Löbner 1987, Büring 1996, Rett 2008, 2018, Solt 2009, 2015, Bale & Schwarz 2020).

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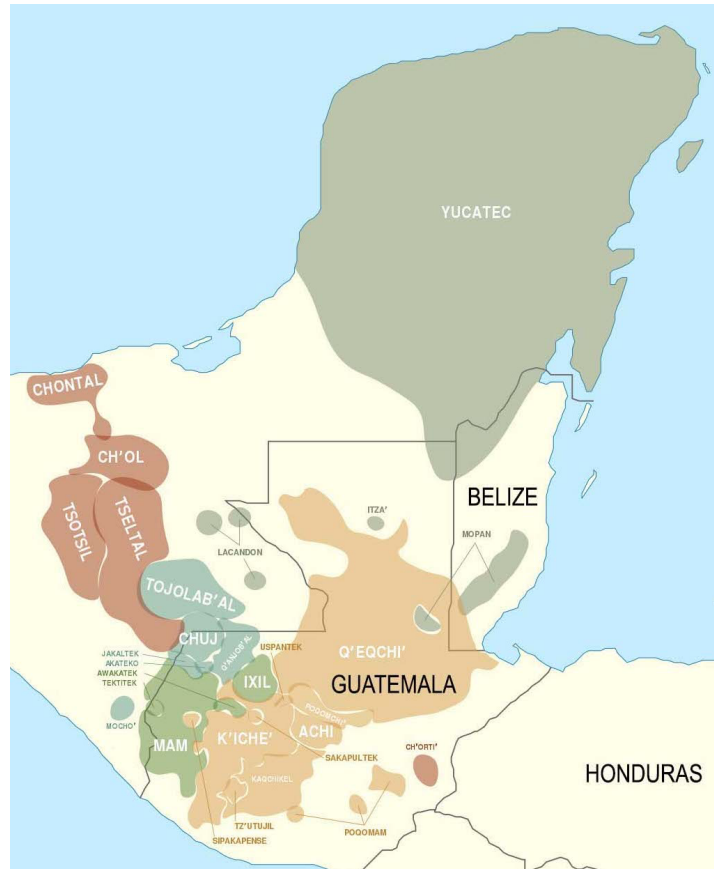
Today

- Investigate value judgement quantifiers (abbreviated “VJQ”) in Chuj, with two main goals:
 - I. Show that VJQs in Chuj fall into two syntactic categories, identifiable through diagnostics:
 - a. **Pred-quantifiers**: the VJQ is a nonverbal predicate
 - b. **Det-quantifiers**: the VJQ is a determiner
 - This first part is based on joint work with Peter Jenks (Royer et al. 2024)
 - II. Consider a putative prediction of the lexical ambiguity approach, namely that:
 - a. **Pred-quantifiers** (3) should be restricted to cardinal readings like (1)
 - b. only **Det-quantifiers** (4) should admit proportional readings like (2)
 - We argue that this prediction is not borne out: both can convey each interpretation
- This has important **implications** for theories of the cardinal/proportional distinction, namely
 - We need a way to express proportional interpretations without comparing two sets.
 - The lexical ambiguity analysis of cardinal/proportional contrast is not on the right track, at least for Chuj.
- **Structure of talk**
 - §2 Basic background on Chuj
 - §3 Two syntactic types of quantifiers in Chuj
 - §4 Interpretation of the two types of Chuj quantifiers
 - §5 Implications for theories of ‘weak’ vs ‘strong’ quantifiers

2 Chuj background²

- Chuj is a Mayan language belonging to the Q’anjob’alan sub-branch (Kaufman 1974, Law 2014).
- Spoken by ~80,000 speakers (Piedrasanta 2009), primarily located in Guatemala and Mexico.
- There are two principal dialects: San Mateo Ixtatán and San Sebastián Coatán.
- Our data come from the San Mateo Ixtatán dialect, collected via text-based searches and via contextualized techniques for semantic fieldwork (Bochnak & Matthewson 2020).

² For additional background on Chuj, see Hopkins 1967, 2021, Maxwell 1982, García Pablo & Domingo Pascual 2007, Buenrostro 2021, and Royer et al. 2022.



Current-day Mayan speaking area (based on Law 2014, p. 25)

- Like other Mayan languages (England 2001, Coon 2016, Aissen et al. 2017) Chuj is a verb-initial, ergative-absolutive, head-marking language.

Set A → ergative/genitive

Set B → absolutive (3rd person Set B is null and not represented in glosses)

(5) **V** **O** **S**
 Ix-y-il [waj Xun] [ix Malin].
 PFV-A3-ver CLF Xun CLF Malin
 ‘Malin saw Xun.’

- Non-verbal predicates (abbreviated “NVP”) are sentence-initial; there’s no copula:

(6) a. **Sonum** ix.
 marimbista she
 ‘She is a *marimbista*.’

c. **Pitz-an** ix.
 wake.up-STAT she
 ‘She is awake.’

b. **Te-junk’olal** ix.
 very-happy she
 ‘She is very happy.’

d. **Ay jun** ix t’atik.
 EXT INDF woman here
 ‘There is a woman here.’

3 Two types of value judgment quantifiers in Chuj

- VJQs in Chuj fall into two syntactic categories:
 - **Pred-quantifiers**, syntactically realized as non-verbal predicates (NVP).
Literally translate as e.g., ‘The women that saw the men were *many*_{PRED}’
 - **Det-quantifiers**, syntactically realized as determiners.
Literally translate as e.g., ‘*Many*_{DET} women saw the men’
- We illustrate this by zooming in on *tzijtum* and *jantak*, which can both mean ‘many’:³
 - §3.1: we argue that *tzijtum* is a nonverbal predicate (Pred-quantifier)
 - §3.2: we argue that *jantak* is a determiner (Det-quantifier)

3.1 Diagnostics for Nonverbal Predicate (NVP) status

1 Ability to function as an NVP

If the VJQ is an NVP, it should be able to function as the predicate of a simple NVP sentence:

- *tzijtum* can (and it occupies the same position as other NVPs in (6)):

(7) a. ¿**Tzijtum** heb ix, tz-y-al chi’, ha ix-he-yamanoch chi’?
many PL she IPFV-A3-say DEM when PFV-A2P-begin DEM
‘So, they were many, we say, when y’all started?’

b. Hi, **tzijtum** heb’ ix.
yes many PL she
‘Yes, they were many.’

(txt, CD300715)

- *jantak* cannot:

(8) Hi, **jantak** heb’ ix...
yes many PL she
‘Yes, many of them...’

(not a full sentence)

³ *Jantak*, like some other determiners in the Chuj language (see Alonso-Ovalle & Royer 2024 and Royer et al. 2024), is not ‘upper-bounded’, insofar as it can convey situations in which *all* relevant individuals in the context satisfy the nominal predicate. We nonetheless assume that the underlying semantics of *jantak* is akin to ‘many’.

2 Predicate-initial syntax

If the VJQ is an NVP, it should show predicate-initial syntax.

- This is true for *tzijtum* (see also (7)):

- (9) a. **Tzijtum heb' anima'** ix-in-il-an-i.
many PL people PFV-B1s-see-AF-IV
'Many people saw me.' | Lit: 'Many were the people who saw me.'
- b. * IX-in-y-il [**tzijtum heb' anima'**].
PFV-B1-A3-see many PL person

- This is not true for *jantak*, which like other DPs, is typically found in a postverbal position.

- (10) IX-in-y-il [DP **jantak heb' anima'**].
PFV-B1S-A3-see many PL person
'Many people saw me.'

- **Nb:** *jantak* can appear in a preverbal DP, but, like other topic/focus DPs in the language (Bielig 2015, Buenrostro 2021, Royer et al. 2024), it must take topic/focus morphology (see (15)).
- We assume the following structure for (9a) (see Royer et al. 2024 for further details).

- (11) [_{PredP} *tzijtum* [CP [DP the people]₁ that saw me __₁]]
Literal translation: 'The people who saw me were many.' (syntax for (9))

3.2 Diagnostics for DP status

1 Ability to appear in the complement of a preposition

If the VJQ is a determiner, it should be able to appear as the complement of a preposition:

- *jantak* can:

- (12) IX-in-xit' ek' [PP t'a **jantak** chonhab'].
PFV-B1-go DIR PREP many town
'I went to many towns.'

- *tzijtum* cannot:

- (13) *[PP **T'a** **tzijtum** chonhab'] ix-in-xit' ek'-i.
PREP many town PFV-B1S-go DIR-IV
Intended: 'I went to many towns.'

- To express the intended meaning in (13), a complex construction with a relative pronoun is needed, further supporting a syntax along the lines of (11) for *tzijtum*.

- (14) [_{PredP} **Tzigtum** [[chonhab']₁ **b'aj** ix-in-xit' ek'-i ___₁]
many town REL.where PFV-B1S-go DIR-IV
Literal translation: 'The towns where I went are many.'

2 Ability to appear in a topicalized DP

If the VJQ is a determiner, it should be possible for it to be part of a topicalized DP:

- *jantak* can:

- (15) [_{TOP} **Ha jantak** heb' winh w-et'b'eyum]₁ ix-in-y-il **heb' winh**₁.
TOP many PL CLF A1S-friend PFV-B1S-A3-see PL him
'As for many of my friends, they saw me.'

- *tzigtum* cannot:

- (16) * [_{TOP} (**Ha**) **tzigtum** heb' winh w-et'b'eyum]₁ ix-in-y-il **heb' winh**₁.
TOP many PL CLF A1S-friend PFV-B1S-A3-see PL him
Intended: 'As for many of my friends, they saw me.'

3.3 Summary of diagnostics:

- From these diagnostics, it is clear *tzigtum* and *jantak* belong to different syntactic categories:
 - *tzigtum* is a nonverbal predicate (Pred-quantifier)
 - *jantak* is a determiner (Det-quantifier)
- Additional diagnostics (indicated in gray) are provided in Appendix A.
- A table with the list of quantifiers, including Pred-VJQ *kennhej* 'few' and Det-VJQ *jay* 'few' seen below, belonging to each category is provided in Appendix B.

Table 1: Syntactic evidence for D vs A status of JVQs in Chuj

Syntactic diagnostics	Pred-Q <i>tzigtum</i>	Det-Q <i>jantak</i>
Can appear as a main predicate of a simple NVP	Yes (7)	No (8)
Must appear sentence initially (Chuj is predicate-initial)	Yes (9)	No (10)
Can be predicates of 'possessive have' constructions	Yes (32)	No (33)
Participates in secondary predication	Yes (35)	No (36)
Can be the complement of a preposition	No (13)	Yes (12)
Can be part of a topicalized DP	No (16)	Yes (15)
Can modify the possessor of a DP	No (38)	Yes (37)
Can appear within sole argument of an NVP	No (40)	Yes (39)

- These syntactic facts lead us to our next goal:
 - Does the syntactic status of the VJQ affects semantic interpretation?
 - Does it have any implications for the weak/cardinal vs. strong/proportional status of VJQs?

4. Testing the semantic interpretation of each type of quantifiers

- VJQs in many languages seem to truly have a double function.
- In English, for instance, ‘many’ can be both a determiner and a predicate (see e.g., Solt 2015 or Rett 2018 for full list contexts in which VJQs are found):

(17) ‘Many’ as a determiner
We bought **many_D** (of the) books.

(18) ‘Many’ as a predicate
We are **many_{PRED}**.

- Chuj VJQs do not show this double syntactic function:

(19) ‘Many’ as a determiner
a. Ix-onh-man **jantak** libro
PFV-B1P-buy many_D book
‘We bought many books.’

(20) ‘Many’ as a predicate
a. **Tzigtum** honh.
many_{PRED} B1P
‘We are many.’

b. *Ix-onh-man **tzigtum** libro
PFV-B1P-buy many_D book

b. ***Jantak** honh.⁴
many_{PRED} B1P

- Chuj thus provides an ideal testing ground to determine whether the syntactic status of a quantifier might affect its semantic interpretation, specifically as pertains to the ‘weak/strong’ contrast.
- If we reconsider the STANDARD APPROACH of the ‘weak/strong’ contrast:

(3) **Few as a cardinality predicate = ‘weak quantifier’**
 $\lambda x. |x| < n$, n is contextually set standard

(4) **Few as a proportional determiner = ‘strong quantifier’**
 $\lambda P_{NP}. \lambda Q_{VP}. |P_{NP} \cap Q_{VP}| / |P_{VP}| < p$, p is a contextually set standard proportion

- We have the following predictions (assuming the standard approach):
 1. **Pred-VJQs** should be **restricted to cardinal interpretations** (if proportions need to be lexically encoded, no proportion possible, since such VJQs don’t take VPs as arguments).
 2. Only the **det-VJQs** should be able to express a proportion, and we might expect them to be disfavored for cardinal interpretations, since pred-VJQs unambiguously convey these.

Next: We show now that neither of these predictions is borne out:

- Both Pred-VJQs and Det-VJQs can express weak and strong interpretations.
- **Nb:** the fact that Pred-VJQs can express strong readings is not unexpected from the perspective of Indigenous languages of North America; similar facts noted in Davis & Matthewson 2019.

⁴ *Jantak* can also convey ‘how many’. In such cases, (2b) would be an acceptable string, but would mean ‘how many are we?’

4.1 Acceptability judgment tasks based on verbal contexts

- Consider the target sentence and interpretations for ‘few’ below:

(21) Target sentence: *Few people that Xuxeb’ and Anix invited to their wedding came*

- a. **Cardinal reading:** number of invited people who came $< n$, assuming n is around 30 for Chuj wedding standards.
- b. **Proportional reading:** the ratio of people who came compared to the number of invited people $< p$, assuming p is around $\frac{3}{4}$ for wedding standards.

- Now consider the following two contexts:

(22) a. Cardinal reading true; proportional reading false

Xuxeb’ and Anix invited 10 people to their wedding, and everyone came. (23/24) = ✓

b. Proportional reading true; cardinal reading false

Xuxeb’ and Anix invited 200 people to their wedding. 50 of them came. (23/24) = ✓

- With **Pred-VJQ** *kennhej* ‘few’, (23) was judged true in both (22a) and (22b).

(23) **Kennhej** heb’ anima’ ix-y-awt-ej waj Xuxeb’ yet’ ix Anix ix-jaw-i.
few_{PRED} PL people PFV-A3- invited-DTV CLF Xuxeb’ and CLF AnixPFV-come-IV
‘(The) few people that Xuxeb’ and Anix invited came.’

- With **Det-VJQ** *jay* ‘few’, (24) was again judged true in both (22a) and (22b).

(24) Ix-ulek’ **jay-wanh** heb’ anima’ t’a s-boda waj Xuxeb’ yet’ ix Anix.
PFV-arrive few_{D-#.CLF} PL person PREP A3-wedding CLF Xuxeb’ and CLF Anix
‘Few people came to Xuxeb’ and Anix’s wedding.’

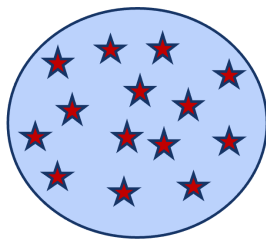
- In all other verbal contexts we tested, the same fact holds:

- **Pred-VJQs** and **det-VJQs** are as acceptable in contexts that force a cardinal interpretation than in contexts that force a proportional interpretation.
- Thus: evidence that both types of quantifiers may each equally convey ‘weak’ and ‘strong’ interpretations.

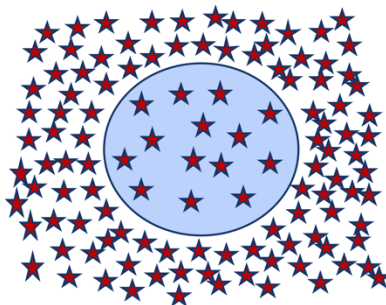
4.2 Acceptability judgment tasks based on visual contexts

- Our elicitation questionnaire also included several visual contexts, like (24):

(25) a. (26/27) = ✓



b. (26/27) = X



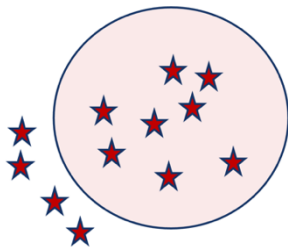
- (25a) should trigger a **cardinal** reading: if a contextual standard for ‘many’ is set to around more than 10 stars, it should be possible to use ‘many’ here.
- (25b) should trigger **proportional** reading: a quantifier like ‘many’ should be out, since the ratio of stars within the circle is smaller than the contextually set standard, say $> \frac{1}{2}$ in this case.
- Again, we find no clear differences in the acceptability judgments of Pred-VJQs vs Det-VJQs, both (26) with a Pred-VJQ and (27) with a Det-VJQ can describe (25a) but not (25b).

(26) **Tzjtum** k'en k'anal tz-k-il t'a yol hoyan tik.
 many_{PRED} CLF star IPFV-A3-see PREP inside circle DEM
 ‘We can see many stars in this circle.’

(27) Tz-k-il **jantak** k'en k'anal t'a yol hoyan tik.
 IPFV-A3-see many_D CLF star PREP inside circle DEM
 ‘We can see many stars in this circle.’

- Moreover, both (26) and (27) were judged true when prompted with visual contexts like (27), again suggesting that they can both give rise to proportional interpretations:

(28) (26/27) = ✓



- Thus: more evidence that both types of quantifiers may convey ‘weak’ and ‘strong’ quantification.

4.3 Translation prompts based on continuations

- Finally, our elicitation questionnaire included contextualized translation prompts that forced one quantifier interpretation over the other.

(29) **Context:** In the town’s library, there are many books. Many of the books at the library were written by Mexican authors, and only a few were written by Guatemalan authors.

a. T’a biblioteka tik, **tzijtum** ch’anh libro ay ek’-i.
 PREP library DEM many_{PRED} CLF book EXT pass-VI
 ‘In the library here, there are many books.’ **(card., Pred-VJQ)**

b. **Tzijtum** ch’anh ix-s-tz’ib’-ej juntzanh mejikano.
 many_{PRED} CLF.PRON PFV-A3-write-DTV INDF.PL Mexican
 ‘Many of them were written by Mexican authors.’ **(prop., Pred-VJQ)**

c. Ay **jay-e’** ch’anh ix-s-tz’ib’-ej juntzanh gwatemaltekos
 EXT few_{D-#}.CLF CLF.PRON PFV-A3-write-DTV INDF.PL Guatemalan
 ‘Few of them were written by Guatemalan authors.’ **(prop., Det-VJQ)**

- The translation prompt in (29a) forces a **cardinal interpretation**
 → we are talking about all the many books at the library, not a proportion of them.
- The translation prompts in (29b) and (29c) force a **proportional interpretation**
 → we are talking about a proportion of the books at that library, not all of them.

- Note that it would be acceptable to use a Det-VJQ instead of a Pred-VJQ in (29a):

(30) T’a biblioteka tik, ay **jantak** ch’anh libro.
 PREP library DEM EXT many_D CLF book
 ‘In the library here, there are many books.’ **(card., Det-VJQ)**

- Again, these data show convincing evidence that Pred-VJQs in (29a) and (29b) and Det-VJQs in (29c) and (30) can both deliver ‘weak/cardinal’ and ‘strong/proportional’ interpretations.

4.4 Summary

- The above provide strong evidence for the following claim:
 - The Pred/Det syntactic status of the quantifier doesn’t affect its ability to convey either cardinal/weak or proportional/strong interpretations.
 - Both kinds of quantifiers can convey both kinds of interpretations.

5 Conclusion and implication for theories of the ‘weak/strong’ contrast

- In this talk, we have seen that:
 1. Chuj features two clear syntactic types of VJQs, that neatly fall into predicates/determiners
 2. Both kinds of quantifiers can have cardinal/proportional interpretations.
- This has important implications for the STANDARD APPROACH to cardinal/proportional distinction (repeated below), which posits semantic ambiguities (Partee 1989, Diesing 1992, de Hoop 1992):
 - (3) **Few as a cardinality predicate = ‘weak quantifier’**
 $\lambda x. |x| < n$, n is contextually set standard
 - (4) **Few as a proportional determiner = ‘strong quantifier’**
 $\lambda P_{NP}. \lambda Q_{VP}. |P_{NP} \cap Q_{VP}| / |P_{VP}| < p$, p is a contextually set standard proportion
- While proportions naturally go with quantificational determiners (Barwise & Cooper 1981), because they compare two sets, Chuj Pred-VJQs show that we need to be able to express proportions without comparing two sets.
 - An additional issue with deriving cardinality vs proportionality lexically is that we’d have to posit lexical ambiguities across different categories of VJQs.
- Other theories, which attribute cardinal/proportional distinctions to pragmatics rather than to semantics, would thus fare better in explaining the Chuj facts (see e.g., Westerståhl 1985, Löbner 1987, Büring 1996, Rett 2008, 2018, Solt 2009, Wellwood 2015, Bale & Schwarz 2020, and others)
- We leave the specific semantic theory of Pred-VJQs and Det-VJQs in Chuj for the future.

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Appendix A: Additional diagnostics for the DP vs NVP status of VJQs

A.1 Additional diagnostics for Nonverbal Predicate (NVP) status

3 Ability to serve as predicate in possessive ‘have’ construction

If the VJQ is an NVP, it could serve as the predicate in possessive ‘have’ constructions:

- As in other Mayan languages (Coon 2016), possessive existential constructions in Chuj are derived by combining an existential predicate with a possessed nominal:

(31) **Ay** heb’ winh h-uninal.
EXT PL CLF A2S-son
‘You have sons.’ (Lit: ‘There are your sons.’)

- In the same way, *tzijtum* can replace the existential to establish the possessive ‘have’ relation:

(32) **Tzijtum** heb’ winh h-uninal.
many PL CLF A2S-son
‘You have many sons.’ (Lit: ‘Your sons are many.’)

- *jantak* cannot do this:

(33) # **jantak** heb’ winh h-uninal
many PL CLF A2-son
Intended: ‘You have many sons’
This would be an incomplete sentence meaning ‘many of your sons’

3 Ability to serve as predicate in ‘secondary predicate’ constructions

If the VJQ is an NVP, we might expect it to be able to serve as the main predicate in possessive ‘have’ constructions (see e.g., Mateo Toledo 2012 for Q’anjob’al).

- These constructions involve complex clauses which combine a secondary nonverbal predicate with an aspectless clause, deriving some form of resultative or depictive meaning:

(34) [_{PRE} **Junk’olal** [_{VP} y-ek’ heb’ paxyalwum t’atik].
content A3-pass PL visitor here
‘The visitors come happy here.’

- As just anticipated, *tzijtum* can partake in such structures:

(35) [_{PRE} **Tzijtum** [_{VP} y-ek’ heb’ paxyalwum t’atik].
many A3-pass PL visitor here
Lit: ‘The visitors come many here.’

- *jantak* cannot do this:

(36) * **Jantak** y-ek' heb' paxyalwum t'atik
 many A3-pass PL visitor here
 Intended: 'Many visitors pass by here.'

A.2 Additional diagnostics for DP status

3 Ability to modify the possessor of a DP

If the VJQ is a determiner, it should be able to modify the possessor of a DP:

- *jantak* can:

(37) W-ojtak [heb' y-et'b'eyum [POSS **jantak** heb' ix ix]].
 A1S-know PL A3-partner many PL CLF woman
 'I know many women's partners.'

- *tzijtum* cannot:

(38) * W-ojtak [heb' y-et'b'eyum [POSS **tzijtum** heb' ix ix]].
 A1S-know PL A3-partner many PL CLF woman
 Intended: 'I know many women's partners.'

4 Ability to appear within the sole DP argument of an NVP

If the VJQ is a determiner, it should be able to appear in the sole argument of an NVP.

- *jantak* can:

(39) Pitz-an [DP **jantak** heb' winh unin].
 wake.up-STAT many PL CLF child
 'Many children are awake.'

- *tzijtum* cannot:

(40) * Pitz-an [**tzijtum** heb' winh unin].
 wake.up-STAT many PL CLF niño
 Intended: 'Many children are awake.'

Appendix B: List of quantifiers by quantifier type

(41) Inventory of quantifiers over entities in San Mateo Ixtatán Chuj

Cuantificadores-D Básicos como argumentos regulares	
<i>jun</i>	‘one’ / singular indefinite determiner
<i>juntzanh</i>	‘some’ / plural indefinite determiner
<i>junjun</i>	‘some / each’
<i>tzun</i>	‘one’ (affective/diminutive)
<i>jantak</i>	‘many/all’
<i>jab’</i>	‘little’ (for mass nouns)
<i>chab’ox-#.CLF</i>	‘few’ (literally: ‘two-three’)
<i>jay-#.CLF</i>	‘few’
<i>#-#.CLF</i>	All numerals with numeral classifier

Cuantificadores-D Foco (muestran preferencia preverbal)

<i>masanil</i>	‘all’
<i>yalnhej+ wh-item</i>	Random choice indefinite
<i>wh-items</i>	All <i>wh</i> -words

Cuantificadores-A Predicativos

<i>tzijtun</i>	‘many’
<i>pim</i>	‘many’
<i>jantaknhej</i>	‘many’
<i>ma(nh)jantak(ok)</i>	‘many’
<i>wal</i>	‘many’
<i>niwan</i>	‘much’ (for mass nouns)
<i>kenhej</i>	‘few’
<i>jujunnhej</i>	‘few’
<i>chekelnhej</i>	‘few’
<i>kenan</i>	‘few’
<i>jay-#. CLF-nhej</i>	‘few’
<i>jab’izin</i>	‘little’ (for mass nouns)
<i>chab’izin</i>	‘little’ (for mass nouns)
